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AUTHOR Schneider, Michael J.
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ABSTRACT

This paper contends that views of science as "objectivist" or "subjectivist" not only represent inaccurate and extreme positions on a continuum but also obscure the importance of argument in the scientific enterprise. It examines the role of argument in the objectivist view of science by exploring the analysis of Henry Johnstone, Jr., of the differences between philosophical and scientific rationality. Next, the paper illustrates the role of argument in the subjectivist view and considers the attack on the objectivist view. Finally, it argues that weaknesses in the subjectivist scheme suggest a more moderate view of science in which scientific rationality is grounded in a combination of argumentation and empirical verification. (FL)

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ARGUMENT AND SCIENCE

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Michael J. Schneider

Texas Tech University

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After the publication of Thomas Kuhn's The Structure of Scientific Revolutions,[1] open controversy raged among scholars in the philosophy of science. Kuhn's work challenged prior conceptions of scientific objectivity and it raised questions about the rationality of the scientific enterprise. It also had a profound impact on the social sciences, where desperate scholars were already re-evaluating the philosophical bases of their disciplines. While Kuhn's work was being domesticated by philosophers of science, it was winning enthusiastic adherents throughout the social sciences.[2] Among many indirect effects of Kuhn's work two valuable contributions have been made. First, Kuhn gave the social sciences a common organizational framework and a common language from which to examine their philosophical foundations.[3] Second, the controversy sparked by Kuhn seems to have generated a growing interest in science as a rhetorical enterprise.

Indeed, work directed at a "rhetoric of science" is now progressing on many fronts. In recent years, one article in a speech journal has attempted to take a Kuhnian perspective on the theoretical treatment of scientific discourse,[4] two articles have called for the study of scientific persuasion,[5] and seven case studies in the rhetoric of science have been conducted.[6] None of these works has attempted to apply, in a central way, principles of argumentation theory to scientific discourse. Nor has argument been differentiated from persuasion in the study of scientific controversy.[7]

In this paper I hope to demonstrate that views of science as "objectivist" (the strong pre-Kuhnian view) or "subjectivist" (the strong Kuhnian view), not only represent inaccurate and extreme positions on a continuum

but they also obscure the importance of argument in the scientific enterprise. To this end the role of argument in the objectivist view of science will be examined by exploring the analysis of Henry Johnstone Jr. on the differences between philosophical and scientific rationality. The role of argument in the subjectivist's view will be illustrated as the attack on the objectivist view is considered. Finally, weaknesses in the subjectivist scheme will suggest a more moderate view of science in which scientific rationality, as conceived by Chaim Perelman, is grounded in a combination of argumentation and empirical verification.

In an article entitled "Rationality and Rhetoric in Philosophy,"[8] Henry Johnstone Jr. sought to drive a wedge between rationality and validity in philosophy. He argued that the connection between rationality and validity cannot be maintained if the characterization of philosophy as a rational enterprise is to be upheld. To Johnstone, rationality in philosophy is characterized not so much by the establishment of formally valid arguments but rather by concern of the philosophical enterprise with the examination of arguments. The distinction between sophistry and rhetoric in philosophy is not based on logic, according to Johnstone, but rather is based on the philosopher's interest in maintaining the philosophical enterprise. In advancing his argument the philosopher acts as a rhetorician. That is, he appeals to his interlocuter to produce a better argument while the sophist wants only to "shut down the assembly line." In the process of delineating this position Johnstone also draws a distinction between rationality in philosophy and rationality in science, a distinction which bears further scrutiny.

Johnstone contends that rationality in science is achieved not through scientific argument, but through methodology. He states, "Scientists to be sure, discuss on the pages of learned journals the validity of arguments propounded by their colleagues. But it is not such discussions that establish the rationality of the scientific enterprise. Such discussions are rather an outgrowth of factors that do render science rational--the experimental method, the respectability of experiments, its explanatory power."[9]

Apparently, Johnstone believes that scientific rationality is established in a way somewhat parallel to the establishment of rationality in philosophy. The scientist explains his methodology in such a way that the experiment can be replicated. In this way the scientist appeals to others in the field to produce a better experiment, just as the philosopher appeals to his interlocuter to produce a better argument. I believe this is the kind of parallel dichotomy that Johnstone would set up between scientific rationality and philosophical rationality. It also represents an "objectivist" view of science, an emphasis on the methods of gathering empirical data. Argument has no place in science, but argument is seen as central to philsophical rationality. Apparently, Johnstone accepts the view that if a scientist utilizes a careful and rigorous method that scientist will reap knowledge which is not subject to argumentation.

The objectivist view was strongly attacked by Kuhn and several other writers who noted that the scientific enterprise involves much more than the process of gathering data. The data must be interpreted within some kind of theoretical framework of "paradigm" if the results are to be

meaningful. Kuhn argues that the acceptance of theoretical frameworks involves a process which is not characterized by either logical or empirical proofs. In fact, Kuhn argued that scientists could not comprehend more than one paradigm let alone make a rational choice between or among paradigms. Kuhn observed further that communication was not possible among practitioners of science working under different paradigms.[10] Kuhn wrote "the competition between paradigms is not the sort of battle that can be resolved by proofs."[11]

Furthermore, Kuhn contends that the triumph of a theory at a particular point in time depends on the number of practitioners who are persuaded to utilize it.[12] Andrew Weigert, following Kuhn, observed that as a result of this process, "a theoretical rhetoric ensues which is aimed at weakening the explanatory power of rival theories."[13] Toulmin adds, "A new concept, theory or strategy, for example, becomes an effective 'possibility' in scientific discourse only when taken seriously by influential members of the relevant profession and it becomes fully 'established' only when it wins their positive endorsement. Conversely, an innovation which the current reference-group declares 'totally unsound' is for the time being as good as dead."[14] In the same vein, Czubaroff points out that devices such as intellectual ridicule are often used in scientific argument in order to achieve persuasion. At another level, Weigert and Wander both suggest that the way scientific reports are written "colors" the interpretation of findings. Barber and Fox note the importance of serendipity in scientific discovery.[15]

Other scholars have gone much further in their indictments of the

objective view of science. Westfall points out that Newton "fudged" on some of his calculations.[16] Brush goes so far as to consider rating the history of science X--for mature scholars only.[17] Kessel writes that the picture of the objective scientist should be discarded in favor of the "picture of the scientist pursuing his position in the face of and despite contradictory facts and even the adverse judgment of many colleagues."[18]

Taken together, these positions might be called the subjectivist view of science because they emphasize those elements of the scientific enterprise which are not logical, rational, or objective (in the way that we ordinarily think of these terms). The subjectivists can certainly marshall enough evidence to cause us to re-evaluate the strong objectivist position. Nevertheless, the subjectivist position also needs to be re-evaluated. As Richard Burke explains, the scientific process can never be considered as totally subjective or irrational. He writes, "Exactly how, and how much, science informs us about reality is controversial to put it mildly; but I think that all philosphers of science would agree that someone who systematically withheld evidence in order to be more persuasive would no longer be doing science."[19]

That Kuhn has occasionally been accepted uncritically by communication scholars[20] is unfortunate because many of his observations have not held up well under critical analysis. Faced with attacks by Scheffler[21] and Shapere,[22] Kuhn quickly retreated from his original position in which he contended that paradigms were not adopted on the basis of logical or empirical proofs.[23] Furthermore, not all periods of rapid scientific change can be classified as revolutionary in the sense that Kuhn describes.

Kuhn's historical treatment appears to be selective in that it ignores paradigmatic change which has been classified by Griffith and Mullins as elitist rather than revolutionary.[24] The elitist movements, according to Griffith and Mullins, differed from the revolutionary movements in that the elitiest groups "were recognized as being of central importance to their respective disciplines even while they were developing (usually within major universities) and while their interests and patterns were diverging from those of other research workers."[25] Griffith and Mullins provide three examples of elitist groups: (1) the quantum mechanics group in physics, under the leadership of Niels Bohr, was centered at Copenhagen from 1920 to 1934 and gave birth to much of modern physics; (2) the algebraist group in mathematics under the leadership of Hilbert, Mihkowski and Klein was centered at Gottingen from 1896 to 1910. The group "thrashed out" the outlines of "much of what is now regarded as modern mathematics"; and (3) the audition research group under Stevens was centered at Harvard from 1940 to 1950. These groups stand in marked contrast to Kuhn's portrayal of major scientific advances as revolutionary and incomprehensible to practitioners outside of the old framework.

Kuhn's view that the triumph of theory at a particular point in time depends on the number of practitioners who are persuaded to utilize it, grounds the evaluation of scientific theories in persuasion rather than in rational argument and demonstration. The notion that persuasion is essential to the life of a theory seems to me indisputable. But persuasion in and of itself does not well characterize the scientific enterprise. There is evidence for the existence of some "rhyme and reason" in science.

Griffith and Mullins provide an interesting example which tends to support the notion that all of science cannot be subjective. They write, "The importance of these [persuasive] activities is clear: groups without students die. Fisher makes this clear in his analysis of the mathematical specialty of invariant theory; this group disappeared because its members had no access to students for training in the specialty. The problems did not die; they still exist, but they have been reshuffled and have become problems in other, living areas (for example, linear algebra)."[26] I take this example to constitute evidence for the existence of an objective phenomena, albeit a problem area, since it was apparently perceived by practitioners from different perspectives.

Part of the reason for the current skepticism concerning scientific rationality is probably a reaction to past overstatement of the "objective" nature of science.[27] While, as Popper has observed,[28] the scientific enterprise can no longer be viewed as dealing in the realm of certainty, scientific rationality remains a feasible notion. Science can be viewed as grounded in the less-than-absolute realm of rationality which is characterized by argument.

The Belgian philosopher-rhetorician Chaim Perelman discusses the role of argument in the scientific enterprise when he explains his notion of the universal audience.[29] Perelman explains, "Certain specialized audiences are readily assimilated to the universal audience, such as the audience of the scientist addressing his fellow students."[30] According to Perelman, the universal audience refers "not to an experientially proven fact, but to a universality and unanimity imagined by the speaker, to the

agreement of an audience which should be universal, since for legitimate reasons, we need not take into consideration those which are not part of it."[31] He further explains, "Argumentation addressed to a universal audience must convince the reader that the reasons adduced are of compelling character, that they are self evident, and possess an absolute and timeless validity, independent of local or historical contingencies."[32] To Perelman, scientific argument, like philosophical argument, goes beyond the bounds of mere persuasion of the immediately perceivable or available audience. It instead is addressed to "certain particularly qualified men."[33] This very limited audience is not a particular audience however. The scientist "supposes that everyone with the same training, qualifications, and information would reach the same conclusions."[34]

While Perelman's position is similar to the objectivist view, his description of scientific rationality is not grounded solely in objective facts but rather is grounded in good reasons based on available information. Empirical evidence is not the sole determinant of the theory. Other considerations such as internal inconsistency of the theory must be borne out, but empirical evidence does play an important role.

Perelman's view of science places argument in a central position in the scientific enterprise. This "moderate" view of science can account for scientific occurrences which are not well accounted for by either the strong objectivist position or the strong subjectivist position. This can be seen if we consider the controversy over the caloric theory and the wave theory of heat in the early nineteenth century.

Stephen Brush reports that prior to the acceptance of wave theory, the

caloric theory of heat, which viewed heat as a material substance, was dominant in spite of well known experiments by Count Rumford and Humphrey Davy which showed heat to be generated by friction. Brush claims that this demonstrates the "irrationality" of science because the acceptance of theory is not gained in direct correspondence with empirical evidence. This situation is not, in my view, "irrational" because there existed other strong reasons and empirical (though-less-direct) support for maintaining the caloric theory. Brush himself explains, "The investigations of William Hershal, Macedonic Meloni, and others show that radiant heat has all the qualitative properties of light: it can be reflected, refracted, even polarized. Thus, by the 1820's, it was generally accepted that whatever theory might be adopted to explain the physical nature of light, a similar theory must be adopted for heat."[35] Because "light was assumed to be composed of material particles rather than the motion of particles,"[36] the desire for and evidence supporting a unified theory of heat and light provided the foundation for acceptance of the caloric theory of heat. This was not a random event, an irrational one, or one which could be explained on the basis of methodology and empirical support alone. The underlying explanation for the acceptance of the caloric theory of heat[37] rests in the arguments which called for such acceptance.

If science is viewed as a rational enterprise and if that rationality is characterized by argument then the application of important tenets of arguments might provide beneficial implications for the scientist. For example, it has often been observed that scientific evidence gains much of its meaning from the theoretical framework in which evidence is gathered.

When a scientist gathers evidence solely on the basis of precedent without considering the merits of arguments related to the theoretical process, the scientist cannot be said to be acting rationally no matter how careful he is methodologically. Ehninger points out that "aside from its obvious superiority over chance, argument is superior to authority and intuition as a way of arriving at reliable decisions because it is self-regulative while they are not."[38] Conducting research merely on the basis of precedent is akin to acting on the basis of authority, and since argument is superior to authority, theoretical argument concerning questions of economy, consistency and external validity is a prerequisite for good research. Past research must be seen as an inadequate justification for future research proposals.

Finally, it should be pointed out that although science and philosophy can both be grounded in argument it does not necessarily mean that argument is the same process in each of these spheres. Although, as Perelman suggests, both may be addressed to a universal audience, the difference in subject matter of these realms of scholarship seems to necessitate at least some differences in the argumentation process. Natanson suggests, for example,

> Philosophical work involves a kind of beginning that turns upon the inquirer; we may speak of philosophical risk as the commitment of the inquirer to reconstruct his world . . . The point is that philosophical argumentation, of our distinction between arguments, argument, and argumentation are to hold, must in its very nature bear a reflexive dimension

> which leads to the true constitution of the self, that philosophical argumentation is defined by existential risk on the part of the participants. In brief, philosophical argumentation can be itself only when the very world of the philsophers is risk and so rendered possible.[39]

While scientific argumentation does not rest on a complete objectivication of the truth, as Johnstone's position implies, it is nonetheless more closely associated with empirical forms of validity than philosophical argumentation is. The scientist may, therefore, not be risking the self in the same sense that Natanson claims philsophers do. So the marriage between scientists and philosophers is not complete. Yet if argument is indeed central to both enterprises, they have more in common than has often been thought. If argument is a central feature of science, a rhetoric of science will have to take argument into account. The neglect of argument and the overemphasis on persuasion as the vehicle of scientific advance has lead to a distorted picture of the scientific enterprise. That portrayal is as misleading as the pre-Kuhnian objectivism which spawned contemporary subjectivist reactions.

[1]Thomas S. Kuhn, The Structure of Scientific Revolutions (Chicago: University of Chicago Press, 1964).

[2]See John D. Heyl, "Paradigms in Social Science," Society, 12 (July-August, 1975), 61-67.

[3]This observation is also derived from Heyl's excellent article on Kuhn.

[4]Paul Newell Campbell, "The Persona of Scientific Discourse," Quarterly Journal of Speech, 61 (1975), 391-405.

[5]Jeanine Czubaroff, "Intellectual Respectability: A Rhetorical Problem," Quarterly Journal of Speech, 60 (1974), 155-164; Phillip C. Wander, "The Rhetoric of Science," Western Speech Communication, 40 (1976), 226-235.

[6]John Angus Campbell, "Darwin and 'The Origin of the Species': The Rhetorical Ancestry of an Idea," Speech Monographs, 37 (1970), 1-14; "Charles Darwin and the Crisis of Ecology, A Rhetorical Perspective," Quarterly Journal of Speech, 60 (1974), 442-449; "Nature, Religion, and Emotional Response: A Reconsideration of Darwin's Affective Decline," Victorian Studies, 18 (1974), 159-174; "The Polemical Mr. Darwin," Quarterly Journal of Speech, (1975), 375-390; Ray Lynn Anderson, "The Rhetoric of the 'Report from Iron Mountain'," Speech Monographs, 37 (1970), 219-231; "Rhetoric and Science Journalism," Quarterly Journal of Speech, 56 (1970), 358-368; William R. Brown and Richard E. Crable, "Industry, Mass Magazines, and the Ecology Issue," Quarterly Journal of Speech, 59 (1973), 259-272.

[7]This is not the time or place to become embroiled in technical questions about the distinction between argument and persuasion. It will suffice to consider argument as a form of persuasion which is grounded in

logical rather than emotional proofs.

[8]Henry Johnstone Jr., "Rationality and Rhetoric in Philosophy," Quarterly Journal of Speech, 59 (December, 1973), 381-389.

[9]Ibid., p. 384.

[10]Kuhn states, for example, "To make the transition to Einstein's universe the whole conceptual web whose strands are space, time, matter, force and so on had to be shifted and laid down again on nature whole. Only men who had undergone or failed to undergo that transformation would be able to discover precisely what they agreed or disagreed about. Communication across the revolutionary divide is inevitably partial." Kuhn, 149-150.

[11]Ibid., p. 147.

[12]Ibid.

[13]Andrew Weigert, "The Immoral Rhetoric of Scientific Sociology," American Sociologist, 5 (1970).

[14]Stephen Toulmin, Human Understanding I (Princeton: Princeton University Press, 1972), p. 266.

[15]See Bernard Barber and Renee C. Fox, "The Case of the Floppy-Eared Rabbits: An Instance of Serendipity Gained and Serendipity Lost," American Journal of Sociology, (1958), 128-136.

[16]Richard S. Westfall, "Newton and the Fudge Factor," Science, 179 (1973), 160.

[17]Stephen G. Brush, "Should the History of Science be Rated X?" Science, 183 (March 22, 1974), 1164-1171.

[18]Frank S. Kessel, "The Philosophy of Science as Proclaimed and Science as Practiced: 'Identity' or Dualism?" American Psychologist, 24 (1969), 1000.

[19]Richard Burke, "Rhetoric, Dialectic, and Force," Philosophy and Rhetoric, 7 (Summer, 1974), 160.

[20]See Campbell; also, Daniel O'Keefe, "Logical Empiricism and the Study of Human Communication," Speech Monographs, 42 (1975), 169-183.

[21]Israel Scheffler, Science and Subjectivity (Indianapolis: Bobbs-Merrill, 1967).

[22]Dudley Shapere, "The Paradigm Concept," Science, 172 (1971), 706-709.

[23]See Kuhn's essays: "Reflections on My Critics," in Criticism and the Growth of Knowledge: Proceedings of the International Colloquium on the Philosophy of Science London 1965, 4, ed. by Imre Lakos and Alan Musgrove (New York: Cambridge University Press, 1970); and "Second Thoughts on Paradigms," in The Structure of Scientific Theories ed. by Frederick Suppe (Urbana, Ill.: University of Illinois Press, 1974).

[24]Belver C. Griffith and Nicnolas C. Mullins, "Coherent Social Groups in Scientific Change," Science, 177 (1972), 959-964.

[25]Ibid., p. 960.

[26]Ibid., p. 962.

[27]For a different type of attack on the objective view of science see Wayne C. Booth, Modern Dogma and the Rhetoric of Assent (Chicago: University of Chicago Press, 1974).

[28]See Karl R. Popper, Conjectures and Refutations (New York: Harper and Row, 1965).

[29]A brief analysis of Perelman's concept of the universal audience can be found in Allen Scult, "Perelman's Universal Audience: One Perspective," Central States Speech Journal, 28 (Fall, 1976), 176-180.

[30]Chaim Perelman and L. Olbrechts-Tyteca, The New Rhetoric: A Treatise on Argumentation (Notre Dame, Indiana: University of Notre Dame Press, 1969), p. 34.

[31]Ibid., p. 31.

[32]Ibid., p. 32.

[33]Ibid., p. 34.

[34]Ibid.

[35]Brush, p. 1165.

[36]Ibid.

[37]It should be noted, today it is recognized that there is some validity to both positions since light behaves like both waves and particles depending upon how it is observed and measured.

[38]Douglas Ehninger, "Argument as Method," Speech Monographs, 37 (June, 1970), 109.

[39]Maurice Natanson, "The Claims of Immediacy," in Philosophy, Rhetoric, and Argumentation ed. by Maurice Natanson and Henry W. Johnstone Jr. (University Park, Penn.: Pennsylvania State University Press, 1965), p. 18.